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Study predicts 20% savings for DC-powered data centers

By Mark Fontecchio, News Writer
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Berkeley, Calif. -- The Lawrence Berkeley National Laboratory is running a demonstration project in Newark, Calif., to compare using AC power vs. DC power to run a data center.

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The idea of data center equipment being powered by direct current, or DC, has been getting more interest in the industry, especially among larger data centers that can justify the initial investment to possibly save money down the line.

William Tschudi, project manager in Lawrence Berkeley's environment energy technologies division, said companies could see a 10% to 20% energy savings if they adopt DC power over alternating current, or AC.

Why? When the utility company sends electricity to a customer, it's in AC because it's easier to distribute in that form. The AC is then converted to DC at the power distribution unit, converted back to AC to begin its path to the servers and finally converted back again to DC one more time at each individual server.

In a DC-powered system, there is only one conversion at the beginning, from AC to DC. This is beneficial because there are fewer opportunities for power and energy loss when there are fewer conversions. DC-powered servers also don't have power supplies built in for the extra conversion, so it can save space in the data center.

The project in Newark, by Lawrence Berkeley, has a side-by-side demonstration of a conventional AC-powered rack of servers next to a DC-powered rack of servers. It has received free equipment and services from companies like Intel Corp., Sun Microsystems Inc. and Hewlett-Packard Co. for the demonstration.

"We'll be running the same set of software on both sets, and we'll be measuring the power consumption for each setup," Tschudi said.

The lab is a science and engineering research division of the University of California, Berkeley and has been around for more than 70 years and is the oldest of the U.S. Department of Energy's national laboratories.

David Douglas, Sun's vice president of eco-responsibility, said energy efficiency in the data center is at the forefront of vendors' and their customers' minds because of skyrocketing power and cooling costs. His company participated because it's curious to see the result, and how that might change what they sell to data centers.

"A lot of our customers are coming to us and saying, 'We're reaching the limits of our data center in space and power,'" he said.

The lab will hold open houses this summer, with the first planned for today and the others on July 12 and 26; and August 9, 16 and 23. It will also have the data from the demonstration available in real time on its Web site.

According to Richard Sneider, managing director of Concord, Mass.-based research firm InterUnity Group, DC-powered data centers would generate less heat and power and be more reliable than AC. But because most mainstream computing is geared for AC, it hasn't taken off yet.

Sneider points to Rackable Systems, out of Milpitas, Calif., a company that provides DC-powered servers, showing that it's possible. "From our perspective, it's a logical next step for today's issues and the major issues that data center managers face today," he said.

Realizing the cost savings in a DC-powered data center still might not be enough to draw consumers over, however. Investing in a DC-powered distribution plant can be costly because it requires much larger wires to carry the current without having power dissipate.

Robert E. McFarlane, president of the Interport Financial Division of New York-based Shen, Milsom & Wilke Inc., said that wires carrying DC can get as big as an inch in diameter; AC wires are one-eighth the size or smaller.

"That's a big wire, and that's not fun to deal

War of currents

There has been an age-old dispute over AC vs. DC power, which really took hold in the late 19th century and has since been dubbed the "War of Currents." DC-power advocate Thomas Edison squared off against AC-power backers George Westinghouse and Nikola Tesla. AC power won by and large because of its ability to be transferred more easily over long distances.

with," McFarlane said. "All I have to do is refer you to copper prices in the last month, and that becomes an interesting concern right there."

McFarlane added that installation and maintenance of a DC-powered system takes a certain level of engineering expertise that some power and engineering companies don't even want to deal with.

"As far as DC-powered data centers, I think it has a definite place. You just have to know what you're doing and that's not as easy as it sounds," he said.

The Lawrence Berkeley lab has two other demonstration projects in the works, both related to data center cooling. One project is studying air distribution in the data center and how to better prevent mixing of hot and cold air. The other will look at the use of outside air to cool data centers.

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